Cat. No 20-132

PRO-31 PORTABLE SCANNER
FM Monitor Receiver
VHF: 30 – 54 MHz / 138 – 174 MHz
UHF: 380 – 512 MHz

PLEASE READ BEFORE USING THIS EQUIPMENT

REALISTIC®

CONTENTS

You'll hear all the action with your new **Realistic** PRO-31 Programmable Scanning Receiver! You have direct access to over 22,300 frequencies in nine action radio bands including police, ham radio and emergency transportation services! And your PRO-31 scans up to 10 channels of your choice so you won't miss any of your favorite transmissions.

The secret to PRO-31's versatility and high performance is a custom-designed microprocessor. This tiny computer is built into a micro-chip in the heart of your scanner. Using the keyboard the microprocessor lets you easily enter and change frequencies whenever you wish. The microprocessor also gives you special functions not found on other portable scanning receivers, like channel lockout and scan delay.

Your PRO-31 achieves superior performance with the very latest in solid-state technology including a phase-locked loop (PLL) IC, 2 C-MOS ICs including microprocessors, 2 integrated circuits, 30 transistors, 40 diodes and a Liquid Crystal Display.

For your protection, please record your scanner's serial number in the box below. You'll find the serial number on the back of the unit.

Serial Number [   ]

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FEATURES

Your PRO-31 Portable Scanner:

- Covers 30 – 50 MHz (VHF Lo), 50 – 54 MHz (ham radio 6m), 138 – 144 MHz (government), 144 – 148 MHz (ham radio 2m), 148 – 174 MHz (VHF Hi), 380 – 450 MHz (ham radio and government), 450 – 470 MHz (UHF Lo) and 470 – 512 MHz (UHF Hi) – over 22,300 channels!
- Scans up to 10 channels continuously.
- Displays channel status and frequencies being scanned, monitored or programmed on a Multi-purpose Liquid Crystal Display (LCD).

- Includes channel Lockout with built-in skipper circuit.
- Provides an optional two-second scan delay to eliminate missed replies.
- Sharpens reception with a crystal filter for 1st IF (10.7 MHz) and a ceramic filter for 2nd IF (455 kHz).
- Holds memorized frequencies with battery backup.

A QUICK LOOK AT YOUR PRO-31

MULTI-PURPOSE DISPLAY — Shows channel and frequency being scanned, monitored, or programmed, and the status of the channels.

SPEAKER — For listening.

PROGRAM Key — Sets the internal microprocessor for entry of a frequency.

CLEAR Key — Clears the display when a program entry error is made.

SCAN Key — Sets the PRO-31 to automatically scan all available channels.

DELAY Key — Holds the PRO-31 on channel until two seconds after a transmission ends.

MANUAL Key — Sets the PRO-31 to manually scan the channels. The Receiver advances one channel each time the button is pressed.

ENTER Key — Enters a displayed frequency into any one of the 10 channels you may select. Channel 10 is displayed as channel "0."

LOCKOUT Key — Enables you to lockout (disable) programmed channels. Press once to lockout. Press again to return channel to normal operation.

NUMBER Keys — Enter the desired channel number and its frequency.

KEY-LOCK Key — Prevents the accidental use of all programming keys except SCAN and MANUAL.

LIGHT Key — Lights up the display for reading in the dark.

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SQUELCH Control – Eliminates background noise between transmissions. With no signal, turn clockwise until noise disappears.

OFF/VOLUME Control – Turn clockwise for power ON. Further rotation will increase volume.

EARphone Jack – For connecting an earphone. The built-in speaker is automatically disconnected.

ANTENNA Jack – Connect the flexible antenna supplied to this jack.

External Power (PWR) Jack

Recharge (CHG) jack

The Battery Compartment holds 6 AA type batteries.

The External power Jack (PWR) lets you connect an external 9-volt DC power source (negative ground) for operation without batteries. Use Radio Shack no. 273-1455 for 120V AC, or no. 14-8440 for 12V Car operation. (Mobile use of scanners may be unlawful or require a permit in some areas. Check with local authorities.)

The PWR jack may be used at any time, with or without batteries installed.

To recharge nickel cadmium batteries in the receiver, simply plug an external 9A volt DC power source (Radio Shack 273-1455) into the recharge (CHG) jack. To fully charge nickel cadmiums, leave the external power connected for 10–18 hours.

NOTE

- The recharge (CHG) jack is to be used only when nickel-cadmium batteries are installed. The unit can operate while nickel cadmium batteries are being charged.
- Never connect external power to the charge jack when regular or alkaline batteries are installed, because charging can cause these batteries to explode.
- Remove external power from the CHG jack during a power failure.

GETTING STARTED

To install batteries, position the Receiver as illustrated, press the ▮♥▮ mark and slide the battery compartment cover off. Take out the battery holder.
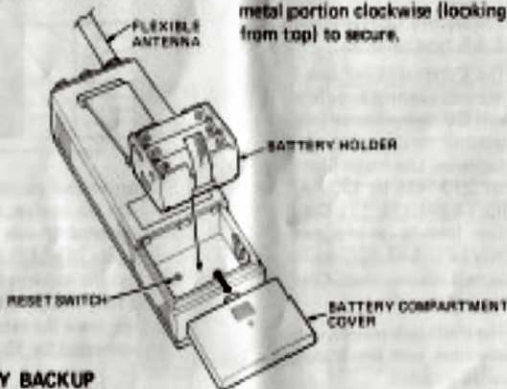
Put six fresh AA batteries in the battery holder, making sure to match polarity markings inside the holder with markings on the batteries (+ to + and − to −). Replace the battery holder and the battery compartment cover.

We recommend that you use rechargeable nickel-cadmium AA batteries, catalog number 23-125, or AA alkaline ENER-CELLs, catalog number 23-552.

Low battery indicator appears when the battery is low. Replace or recharge the batteries.

ANTenna

Attach the flexible antenna to ANT connector. Rotate the metal portion clockwise (looking from top) to secure.

FLEXIBLE ANTENNA

BATTERY HOLDER

RESET SWITCH

BATTERY COMPARTMENT COVER

MEMORY BACKUP

Memory back-up starts functioning the second you supply power to your PRO-31 (with batteries or external power,) and continues even when the power switch is turned "OFF."

Even after removing the batteries or external power, the memory will be backed up for approximately one hour.

When the Batteries are low (low battery indicator on), the

memory back-up will operate for up to three months. However, since weak batteries can leak, you should replace them and avoid damage to your scanner.

RESET SWITCH

If the LCD fails to work properly just after you connect new batteries or external power to your PRO-31, use the Reset Switch.

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Remove the batteries and all external power. Then use a ball point pen, etc. to push the Reset switch through the hole on the bottom of the Battery compartment.

When the reset switch is pushed, all frequencies will be cleared to "000.000," requiring you to re-enter your desired frequencies.

Insert the battery holder and return to normal operation.

You can use your PRO-31 with an external mobile antenna or outdoor base antenna by using the BNC connector, after you remove the flexible antenna.
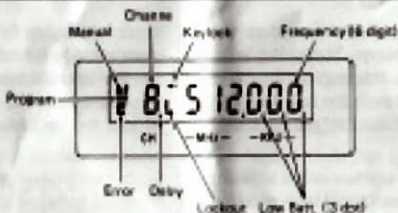

OPERATING YOUR PRO-31

Turn on your PRO-31 by rotating VOLUME clockwise. (When first turned on, your PRO-31 might start scanning.)

Rotate SQUELCH fully counter-clockwise. You'll hear a rushing noise from the speaker. Slowly rotate SQUELCH clockwise until the noise stops. You're now ready to start entering frequencies!

Understanding the Display

The liquid crystal display (LCD) on your PRO-31 can display the channel number, the frequency being received, and the status of different functions. Here's a brief rundown on what the LCD symbols mean when receiving stations.

RECEIVER OPERATIONS DISPLAY

Programming Frequencies

Press numeric keys to program the desired frequency, and press **ENTER**.

Make a mistake while entering a frequency? Just press **CLEAR** to clear it.

If you enter a frequency that is outside a PRO-31 band range, "E" (Error) will be displayed. Press **CLEAR** and select another frequency.

Any frequency within a PRO-31 band range will be accepted. When you press **[ENTER]**, the scanner will automatically round-off any slightly inaccurate entry to the closest "correct" frequency.

In case you're wondering . . . . .

. . . The tuning range of your PRO-31 is permanently stored in the microprocessor chip. There's no way it can be extended or altered — even by a skilled electronics technician. So if you try to enter a frequency not in the PRO-31's tuning ranges, you'll get an error message every time!

When you program:	Display will show:
Low and High Band (5 kHz step)	
XXX.XX0 MHz to XXX.XX4 MHz	XXX.XX0 MHz
XXX.XX5 MHz to XXX.XX9 MHz	XXX.XX5 MHz
UHF Band (12.5 kHz step)	
XXX.X00 MHz to XXX.X09 MHz	XXX.X00 MHz
XXX.X10 MHz to XXX.X19 MHz	XXX.X12 MHz (actually XXX.X125 MHz)
XXX.X20 MHz to XXX.X29 MHz	XXX.X25 MHz
XXX.X30 MHz to XXX.X49 MHz	XXX.X37 MHz (actually XXX.X375 MHz)
XXX.X50 MHz to XXX.X59 MHz	XXX.X50 MHz

XXX.X60 MHz
to
XXX.X69 MHz

XXX.X62 MHz
(actually
XXX.X625 MHz)

XXX.X70 MHz
to
XXX.X79 MHz

XXX.X75 MHz

XXX.X80 MHz
to
XXX.X99 MHz

XXX.X87 MHz
(actually
XXX.X875 MHz)

Note: Figures below four decimal places are not displayed, but are automatically rounded and entered.

Before programming frequencies, make sure your PRO-31 is turned on.

Suppose you want to program channel 1 to receive 162.55 MHz. Here's how you would do it:

1. Be sure the keylock indicator is off.

2. Press MANUAL and select channel 1. You can do this in two ways: press MANUAL continuously until the display indicates channel 1, or by pressing 1.

3. Press PROGRAM.

4. Press 1 6 2 • 5 5. Check the display to make sure the frequency it shows is the one you meant to program. If it is, press ENTER.

5. To add more frequencies, press PROGRAM to advance to the next channel and follow the steps above.

6. If you ever want to change the frequency entered for a specific channel, enter the new frequency over the old one, using steps 2, 3, and 4.

After entering your desired frequencies, you may wish to press the KEY-LOCK key and prevent accidental changes to your program. When the key-lock indicator is on, the PRO-31 will ignore all keys pressed, except SCAN and MANUAL.

Using the Scanning Function

Your PRO-31 will automatically scan all the channels you've programmed and stop whenever it finds a signal. To scan channels, press SCAN.

To stop scanning, press MANUAL; then you can select specific channels you want to listen to.

Important! Your PRO-31 won't scan unless SQUELCH is set to the point where no sound is heard between transmissions (i.e. no "hiss" sound).

Delay Function

When your PRO-31 is scanning, it will stop whenever it finds a channel with a signal. As soon as the signal ends, it immediately begins scanning other channels. Most transmissions are part of a two-way communication. To make sure you don't miss any replies, press DELAY. Your PRO-31 will then hold the channel at least two seconds after each transmission, giving you time to hear replies. The delay indicator will show on the display when the delay function is used. To release the delay function, press DELAY again.

Lockout Function

You might want your PRO-31 to skip certain frequencies while it's scanning (such as continuously transmitted weather broadcasts). To lock out such channels, follow these steps:

1. Press MANUAL to stop scanning.

2. Continue pressing MANUAL until you reach to the channel you want to lock out.

3. Press L/OUT. The display will show "L" indicating this channel will be skipped during scanning.

To release the lockout function:

1. Press MANUAL to stop scanning.

2. Advance to channel that is locked out.

3. Press L/OUT again. "L" will disappear from the display.

You can lockout up to 9 channels.

Display Light

Push LIGHT to illuminate the display in the dark.

Low Battery

Low battery indicator: three dots will appear on the right of display when the battery is low. Replace or recharge the batteries.

Birdies

"Birdies" are the products of internally generated signals that make some frequencies difficult or impossible to receive. If you program one of these, the Scanner locks up and you'll hear only noise on that frequency.

If the interference is not severe, you might be able to rotate SQUELCH clockwise to cut out the "birdy".

The most common "birdies" to watch out for are listed below.

30.740 MHz	46.320 MHz
31.990 MHz TO	47.300 MHz
32.105 MHz	140.800 MHz
32.700 MHz	147.200 MHz
TO	147.500 MHz
32.800 MHz	TO
34.940 MHz TO	147.900 MHz
35.000 MHz	149.300 MHz TO
38.400 MHz	149.550 MHz
40.980 MHz	153.600 MHz
41.950 MHz TO	160.000 MHz
42.030 MHz	168.400 MHz
44.800 MHz	421.200 MHz TO
	422.000 MHz

Even with the SQUELCH control set to maximum (fully clockwise), scanning may stop on or around some of these frequencies. If the signal is strong enough (above 10 µV in technical terms) you can listen for transmissions on the channel. But the receiver will have to be MANUALLY moved off the troublesome frequency.

Earphone Listening

If you're having difficulty hearing in a noisy area or if you don't want your scanner to bother other people, plug an earphone into the Earphone jack (EAR) for private listening. This will automatically disconnect the built-in speaker.

Note: For greater clarity in noisy locations, we suggest using an extension speaker assembly, Cat. No. 21-549. You will also require a subminiature adapter, 274-327, for connection.

BEFORE YOU CALL FOR HELP

The PRO-31 is ruggedly built with all parts conservatively rated. However, you should treat it with care. For long life, don't subject it to excessively rough handling, and keep it free from dirt and excessive humidity.

We hope you don't — but here are some suggestions:

Problem	Possible Cause	Remedy
SCANNER is totally inoperative	No power	Check to see that batteries are good and are properly installed.
Scanner is on, but will not scan	1) Channels are locked out. 2) Squelch control is not adjusted correctly.	1) Press Manual, then release each channel from lockout one-by-one. 2) Adjust SQUELCH clockwise.
Scan locks on frequencies having no clear transmissions.	"Birdies"	Avoid programming frequencies listed on page 11, or only listen to them manually.
Your PRO-31 locks up or you want to completely clear all memories.		Remove battery holder and external power, and press the reset button with a pen or pencil.

If none of these suggested remedies solves the problem, return your set to your nearby Radio Shack for repair by a qualified technician.

SPECIFICATIONS

FREQUENCY COVERAGE:
VHF-Lo
30 – 54 MHz (in 5 kHz steps)
Government
138 – 144 MHz (in 5 kHz steps)
Ham
144 – 148 MHz (in 5 kHz steps)
VHF-Hi
148 – 174 MHz (in 5 kHz steps)
Ham/Gov't
380 – 450 MHz (in 12.5 kHz steps)
UHF-Lo
450 – 470 MHz (in 12.5 kHz steps)
UHF-Hi ("T")
470 – 512 MHz (in 12.5 kHz steps)

CHANNELS OF OPERATION:
Any 10 channels in any band combinations.

SENSITIVITY:
20 dB Signal-to-Noise ratio at 3 kHz Deviation:

30 – 54 MHz	0.6 μV
138 – 174 MHz	1.0 μV
380 – 512 MHz	1.0 μV

SPURIOUS REJECTION:

30 – 54 MHz	50 dB at 40 MHz
138 – 174 MHz	50 dB at 150 MHz
380 – 512 MHz	Not specified.

SELECTIVITY:
±9 kHz, −6 dB
±15 kHz, −50 dB

IF REJECTION:
10.7 MHz   50 dB at 154 MHz

SCANNING RATE:
8 channels/sec.

DELAY TIME:
2 seconds

MODULATION ACCEPTANCE:
±5 kHz

IF FREQUENCIES:
10.7 MHz and 455 kHz

FILTERS:
1 crystal filter, 1 ceramic filter

SQUELCH SENSITIVITY:

Threshold	Less than 1.0 μV
Tight	(S+N)/N 15 dB

ANTENNA IMPEDANCE:
50 ohms

AUDIO POWER:
300mW nominal

BUILT-IN SPEAKER:
2" (5cm) 8 ohm, dynamic type

POWER REQUIREMENTS:
+9V DC, 6 AA batteries, or a suitable adapter (negative ground only)
Current drain:
60 mA (Squelched)
160 mA (full volume unsquelched)

DIMENSIONS:
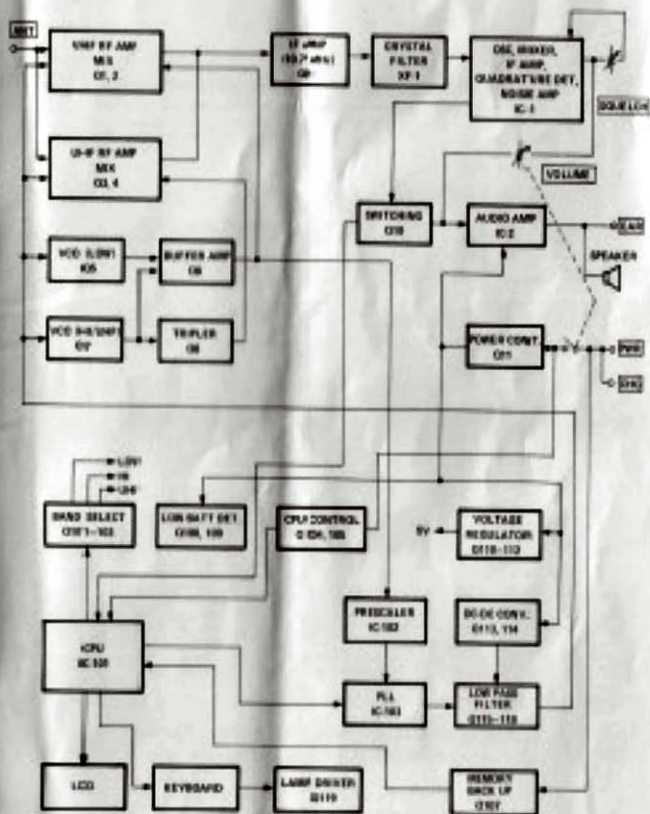187 (7 3/8") x 74 (2 15/16") x 42 (1 10/16")mm HWD

WEIGHT:
1.1 lbs (500g)

FREQUENCY LOG

Frequency	Location and Use

BLOCK DIAGRAM

U.S. PATENT NOS.
3,794,925
3,801,914
3,961,261
3,962,644
4,027,251
4,092,594
4,123,715
4,245,348

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